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RESEARCH AID

PETROLEUM TERMINOLOGY

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FOREWORD

The purpose of this research aid is to provide a basis for uniform usage and understanding of certain pertinent petroleum terms which commonly appear in intelligence reports.

The glossary selected has been purposely limited to basic words. Petroleum analysts will, of course, have access to much more complete sources of information.

The criterion for the selection of terms defined in the glossary in Section I and for the factors tabulated in Section II has been that of maximum usefulness consistent with reasonable brevity. In defining the terms selected for the glossary, every effort has been made to avoid technical jargon. Inevitably this has resulted in some lack of precision for a few terms but does not limit the usefulness of those terms -- except to the petroleum technologist. Also, some terms, particularly in the field of petroleum processing, which sometimes appear in finished petroleum intelligence and should therefore be included have been omitted because of the difficulty of drafting simple, nontechnical definitions. Some of these omitted terms may be included in subsequent editions of this research aid.

Sections I and II present information of significance throughout the petroleum industry. Section III, relating only to the petroleum industry of the USSR, is included in this research aid primarily to direct the attention of intelligence analysts to the nature and significance of some of the problems involved in the translation of Russian language material into English usage in the US petroleum industry. It is also hoped that Section III may stimulate study of the Russian language by petroleum technologists and increase the coordination between linguists and technologists in the study of petroleum problems.

It is hoped that comments and suggestions from analysts using this research aid will provide the basis for useful revisions and additions to subsequent editions or supplements.

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PETROLEUM TERMINOLOGY

I. Glossary of Selected Terms Used in the US Petroleum Industry.

Introduction.

The terms defined in Section I are petroleum terms which are commonly used in finished intelligence reports and may be misunderstood or misinterpreted. Most of the terms selected are those used in the US petroleum industry. A few of the terms do not fall in this category but appear in the ORR Standard Classification of Economic Activities and Factors. 1/*

This glossary is arranged in three groups, selected primarily on the basis of the ORR Standard Classification of Economic Activities and Factors, as follows:

Group A. Glossary of terms used in the extractive phase of the petroleum industry (ORR Standard Classification 13).

Group B. Glossary of terms used in the manufacturing phase of the petroleum industry (ORR Standard Classification 32).

Group C. Glossary of miscellaneous terms used in the petroleum industry.

Included are several terms which do not appear in the ORR Standard Classification but which need definition. Complete coverage of such additional terms cannot be attained in this initial edition of this glossary. Contemplated future editions or supplements will include such additional terms together with any necessary revisions of definitions given herein.

The terms defined in Section I will carry serial numbers beginning with number 1 and continuing, throughout Group A, Group B, and Group C, through number 47. When these numbers (which are also listed in an alphabetical checklist, Table 1**) follow the terms in the text, they will appear in parentheses.

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* For serially numbered source references, see Appendix D.

** Table 1 follows on p. 2.

Comments on usage and significance of the terms defined are included where warranted. In some cases, such comments will follow several related terms or an entire group of terms.

To emphasize the usage and significance of a few important terms, two or more definitions from different sources are given.

Table 1

Alphabetical List of Terms Defined

Term	Definition Number a/	ORR Standard Classification
API gravity	39	N.A.
Asphalt	31	32162
Aviation gasoline	13	3211
Bitumen	31	32162
Ceresin	33	32169
Consumption	40	N.A.
Crude oil	2	131
Crude residue, crude oil residue	29	3216
Disposal	46	N.A.
Diesel fuel	24	32141
Distillate fuel oil	26	32143
Distillate lubricating oils	15	321

a. A few of the terms in this list do not have individual definition numbers assigned to them. They appear in the definition indicated by number. The meaning of such terms is shown by context in the definition.

Table 1

Alphabetical List of Terms Defined
(Continued)

Term	Definition Number	ORR Standard Classification
Distillate products	15	321
Domestic demand	41	N.A.
Exports	42	N.A.
Finished gasoline	7	133
Gas oils	27	32144
Heating kerosine	22	32135
Heavy diesel fuel	25	32142
Heavy distillate oils	23	3214
Jet fuel	17	32131
Kerosine	19	3213
Lamp kerosine	20	32133
Light distillate oils	16	3213
Ligroine	18	32132
Liquefied natural gas	9	132
Liquefied petroleum gas	6	133
Liquefied petroleum gas	35	3218

Table 1

Alphabetical List of Terms Defined
(Continued)

Term	Definition Number	ORR Standard Classification
Liquefied refinery gas	35	3218
Long residue	29	3216
LPG	6	133
LPG	35	3218
Lubricants	28	3215
Mazut	29	3216
Mazut	30	32161
Microcrystalline wax	33	32169
Motor fuel	25	32142
Motor gasoline	14	3212
Native asphalt	31	32162
Natural gas	3	132
Natural gas	36	321
Natural gas liquids	4	133
Natural gasoline	5	133
New supply	43	N.A.

Table 1

Alphabetical List of Terms Defined
(Continued)

Term	Definition Number	ORR Standard Classification
Other products	8	133
Ozokerite	33	32169
Paraffin wax	33	32169
Petrolatum	33	32169
Petroleum	1	13
Petroleum coke	32	32163
Petroleum products	12	321
Petroleum resources	11	13
Petroleum stockpile	44	N.A.
Pitch	32	32162
POL	45	321
Proved reserves	10	13
Reduced crude, reduced crude oil	29	3216
Refinery gas	34	3217
Residual fuel oils	30	32161
Residuals	29	3216

Table 1

Alphabetical List of Terms Defined
(Continued)

Term	Definition Number	ORR Standard Classification
Residuals such as road oils, tars	33	32169
Rich natural gas	3	13
Road oils	33	32169
Shale gas	37	322
Shale oil	37	322
Short residue	29	3216
Solar oils	27	32144
Specific gravity (sp gr)	38	N.A.
Synthetic oils	47	321
Synthetic petroleum	47	321
Tar	33	32169
Topped crude, topped crude oil	29	3216
Total demand	46	N.A.
Tractor kerosine	21	32134
Wet natural gas	3	132

Group A. Glossary of Terms Used in the Extractive Phase of the Petroleum Industry.

1. Petroleum (ORR Standard Classification 13).

a. Petroleum is "Defined as a material occurring naturally in the earth which is predominantly composed of mixtures of chemical compounds of carbon and hydrogen with or without other non-metallic elements such as sulfur, oxygen, nitrogen, etc. Petroleum may contain, or be composed of, such compounds in the gaseous, liquid, and/or solid state, depending on the nature of these compounds and the existent conditions of temperature and pressure." 2/

b. "Petroleum is an extremely complex mixture of naturally occurring hydrocarbons and other substances that are found in the solid, liquid, and gaseous states. Asphalts and mineral waxes are common varieties of solid petroleum; crude oil is liquid petroleum, and natural gas is a form of petroleum in the gaseous or vapor state." 3/

c. "PETROLEUM, from the Latin petra (rock) plus oleum (oil), is a complex mixture of chemical substances, predominantly hydrocarbons of various types, but also containing smaller proportions of other chemical substances. ... In form, petroleum ranges from gases to solids, but its most important state is as it comes from the ground in the form of oil, the only liquid mineral, commonly and commercially known as 'crude oil.' Petroleum also occurs as a colorless vapor, natural gas, which is comprised of the lighter and more volatile portions of the hydrocarbon mixture; and as a solid or semi-solid, asphalt." 4/

d. "PETROLEUM (Latin form for rock oil) is a naturally occurring, complex, and variable mixture of hydrocarbons of similar or associated origin and occurrence. It is found in gaseous, liquid, and solid forms in the porous formations of the earth, principally those of sedimentary origin, and varies widely in composition and quality, for it frequently contains various compounds of sulphur, nitrogen, and oxygen in addition to hydrogen and carbon, which compose all hydrocarbons. It appears chiefly in the form of natural gas and crude oil, either separately or in close association or intersolution with each other." 5/

Comment on 1:

For many years, petroleum was generally construed to mean crude oil, substantially as defined in 2, below. This was the recognized and accepted definition in the petroleum industry 30 years ago. 6/ At least one recent petroleum dictionary 7/ uses this obsolete definition, and some chemical technologists restrict the meaning of petroleum to cover crude oil only. 8/ A change in emphasis has occurred in recent years in the usage of the term petroleum -- from meaning predominantly crude oil to meaning natural gas and crude oil. This change is shown by definitions c and d, above, which are from two different editions of the same source (The Encyclopedia Americana), one for 1942 (c, above) and the second for 1953 (d, above).

The relative importance of the three components of petroleum -- crude oil (2),* natural gas (3), and natural gas liquids (4) -- is well illustrated by the relative quantities of proved reserves of such components. This is reflected in Table 2,** which gives proved reserves of petroleum by components in the US as of 31 December 1946 compared with 31 December 1953, covering an elapsed time of 7 years with relative growth rates for this period.

It should be noted that all four definitions given above for petroleum refer to it as a naturally occurring substance. Where synthetic petroleum (47) is meant, or where it is included with petroleum, it should be specifically designated.

2. Crude Oil (ORR Standard Classification 131).

Crude oil as defined by usage 9/ is that component of petroleum which is a liquid when extracted from the deposit and is separated from the other components at or near the wellhead in separators or by other means. Some of the lighter hydrocarbons (natural gas and natural gas liquids) may be retained in solution in the crude oil as it is discharged from the separators, or they may be discharged with the natural gas, depending upon the character of the petroleum and upon the particular production practices. From the separators the crude oil is normally run to field tanks, where additional natural

* A number in parentheses following a particular term, as pointed out in the Introduction, corresponds to the number given the definition of that term in Section I.

** Table 2 follows on p. 9.

Table 2

Proved Reserves of Petroleum Components in the US a/
1946 and 1953

Petroleum Component	31 December 1946 Quantity (Million Metric Tons)	31 December 1946 Percent of Total	31 December 1953 Quantity (Million Metric Tons)	31 December 1953 Percent of Total	Annual Growth Rate (Percent)
Crude oil	2,829	42.7	3,923	43.5	4.78
Natural gas liquids	321	4.8	535	5.9	7.57
Total liquid petroleum	3,150	47.5	4,458	49.4	5.09
Natural gas	3,481	52.5	4,573	50.6	3.97
Total petroleum	6,631	100.0	9,031	100.0	4.51

a. These reserves are computed from sources 10/ and 11/.

gas and natural gas liquids may come out of solution in the crude oil and thus be produced as these two remaining components of petroleum. Crude oil may therefore be defined as that liquid component of petroleum separated at or near the well and stabilized at atmospheric pressure and temperature. In some areas, notably in the Middle East, the stabilized crude oil is discharged from central stabilization plants serving a number of wells. Under this production practice the entire petroleum production from each well is run directly to the central stabilization plant rather than to well separators.

3. Natural Gas (ORR Standard Classification 132).*

"Gaseous forms of petroleum, commonly called 'natural gas,' consist of mixtures of hydrocarbon gases and vapors, the more important of which are methane, ethane, propane, butane, pentane, and hexane, all of the paraffin series ... ." 12/

In US practice, in reporting production and reserves of natural gas, 13/ it is considered to be "dry," or "pipeline," gas -- that is, natural gas after the removal of natural gas liquids, if any. This usage represents the recommended meaning for the term natural gas. The terms wet natural gas or rich natural gas may be used to designate natural gas carrying recoverable quantities of natural gas liquids before processing for the recovery of this latter component. Under this definition, natural gas will contain only limited or negligible quantities of the heavier hydrocarbons (propane through hexane) which will remain in the gaseous form in natural gas pipelines.

Natural gas may therefore be defined as that component of petroleum which is stabilized in gaseous form for pipeline transportation from the oil or gas field or petroleum-producing area.

4. Natural Gas Liquids (ORR Standard Classification 133).

" ... Natural gas liquids are defined as those hydrocarbon liquids which are gaseous or in solution with crude oil in the reservoir and which are recoverable as liquids by the processes of condensation or absorption** which take place in field separators, scrubbers, gasoline plants, or cycling plants. Natural gasoline, condensate, and liquefied petroleum gases fall in this category. While the liquids so collected and the products derived from them in some of the modern plants are known by a variety of names, they have been grouped together ... under the general heading 'Natural Gas Liquids.'" 14/

* See also the definition of natural gas as a product (36).
** The term adsorption should be added to the terms condensation and absorption in this definition in order to cover fully all processes.

Comment on 3 and 4:

The US Bureau of Mines reports the US production of natural gas liquids under four subcomponents: natural gasoline, liquefied petroleum gases (LPG), finished gasoline, and other products. 15/ Some of these subcomponents, notably LPG and finished gasoline, may be shipped by the petroleum producer direct to jobbers for marketing.

In some cases, natural gas may also be delivered directly to ultimate consumers by the producer. In all such cases, these petroleum components and subcomponents produced in the extractive phase of the petroleum industry (ORR Standard Classification No. 13) are indistinguishable in their utilization from petroleum products (12) produced in the manufacturing phase of the industry (ORR Standard Classification No. 32). See the definitions of liquefied petroleum gas, or LPG (as a petroleum product) (35), and natural gas (as a petroleum product) (36).

In the statistics on production and reserves of the American Petroleum Institute and the American Gas Association 16/ and in the petroleum statistics of the US Bureau of Mines, 17/ both natural gas and natural gas liquids are identified with the extractive phase of the industry. In source 18/ the Bureau of Mines identifies liquefied refinery gases (35) as a petroleum product derived in the refining or manufacturing phase of the industry, but from the point of view of use it is recognized as being identical with liquefied petroleum gases. Likewise, refinery gas (34) is identified as a fuel gas produced at refineries which may be used in lieu of natural gas. Therefore, certain petroleum products (12) going directly to consumers originate in both the extractive and the manufacturing phases (ORR Standard Classification Nos. 13 and 32).

5. Natural Gasoline.

Natural gasoline, a subcomponent of natural gas liquids (4), is defined as "A product produced from natural gas by: 1, compressing the natural gas; or, 2, an absorption process whereby the natural gas is bubbled through an absorption oil which picks up from the gas the desired natural gasoline; or, 3, by adsorption on a solid adsorbent." 19/

6. Liquefied Petroleum Gases, or LPG.

LPG, a subcomponent of natural gas liquids (4),* are "Industry initials for certain liquefied petroleum gases. These are hydrocarbon fractions lighter than gasoline, such as butane, propane, etc., which are kept under pressure in a liquid state and marketed for various industrial and domestic gas uses." 20/

Comment on 6:

LPG is also known as butane, propane, bottled gas, and the like. Its use as a motor fuel for tractors and trucks is rapidly expanding, and in some countries it is used for automobiles.

7. Finished Gasoline.

As reported by the Bureau of Mines, 21/ finished gasoline, a subcomponent of natural gas liquids (4), is a natural gas liquid which meets the requirements for motor gasoline (14) without further blending or processing. In 1952, 76 percent of the reported production of finished gasoline was shipped directly to jobbers for marketing. In the same year, only 9 percent of the reported natural gasoline was shipped to jobbers, the remainder being shipped to refineries. Thus the distinction between natural gasoline and finished gasoline as subcomponents of natural gas liquids, is at least partially a difference in emphasis in their utilization. Finished gasoline as reported by the Bureau of Mines includes 1 to 2 percent of other finished products designated naphthas, which are mostly special solvents.

8. Other Products.

The term other products, a subcomponent of natural gas liquids (4), as used by the Bureau of Mines 22/ to denote the remaining subcomponent of natural gas liquids production, is simply identified as condensate, kerosine, distillate fuel, and the like. As indicated in the table under the following comment, these comprise a relatively minor proportion of the total production of natural gas liquids in the US.

* See also the definition of LPG as a product (35).

Comment on 8:

The relative significance of natural gas liquids production in the US is indicated in Table 3, which shows petroleum production by components and subcomponents for 1946 and 1953 and the average annual growth rate of production over this 7-year period.

Table 3

Production of Petroleum Components in the US a/
1946 and 1953

Petroleum Component or Subcomponent	1946 Quantity (Million Metric Tons)	1946 Percent of Total	1953 Quantity (Million Metric Tons)	1953 Percent of Total	Annual Growth Rate (Percent)
Natural gas liquids subcomponents					
Natural gasoline	7.5	2.1	12.5	2.3	7.6
LPG	3.3	0.9	12.3	2.2	20.7
Finished gasoline	1.0	0.3	3.0	0.5	17.0
Other products	1.3	0.4	2.0	0.4	6.3
Total natural gas liquids	13.1	3.7	29.8	5.4	12.5
Crude oil	234.0	65.4	313.4	57.0	4.3
Natural gas	110.6	30.9	206.7	37.6	9.3
Total petroleum products	357.7	100.0	549.9	100.0	6.3

a. The production of each component in this table is from source 23/ for 1946 and from source 24/ for 1953. The distribution of the production of subcomponents of natural gas liquids is from source 25/ for

Table 3

Production of Petroleum Components in the US a/
1946 and 1953
(Continued)

1946 and from source 26/ for 1953. The total production of natural gas liquids, as shown in the annual reports of the American Petroleum Institute (API) 27/ and the American Gas Association (AGA), 28/ is larger than the production shown by the US Bureau of Mines 29/ because of inclusion of some production by the API-AGA not reported by the Bureau of Mines. Natural gas liquids produced in certain fields which are remote from direct outlets are shipped by blending with the crude oil shipped from the field. API-AGA production statistics include such natural gas liquids, but the Bureau of Mines statistics do not. The difference in 1946 was 1.2 million metric tons, and in 1953 it was 5.8 million metric tons.

Attention is directed to the relatively rapid expansion of the production of natural gas liquids in the US shown in Table 3. LPG production in particular has increased at an annual rate of 20.7 percent, compared with 12.5 percent for natural gas liquids as a whole. For comparison, production of natural gas is increasing at a rate of 9.3 percent, and crude oil at a rate of only 4.3 percent. Production of crude oil is not increasing as rapidly as demand, and the difference is supplied by imports.

9. Liquefied Natural Gas.*

"Liquefied natural gas should not be confused with liquefied petroleum gases ... . Liquefied /natural/ gas ... is contained under atmospheric pressure in standard steel shells that have been heavily insulated" to maintain an interior temperature of -258°F. The reduction from a gas to a liquid is at a volume ratio of 600 to 1. 30/

Comment on 9:

Natural gas may be liquefied by subjecting it to pressure and then cooling it below its critical temperature. 31/ In its liquid state, natural gas may be stored and transported in much smaller containers than in its gaseous state, as shown by the volume

* See also the definition of natural gas (3).

reduction of 600 to 1. Stored in its liquid state near consuming centers, it can be used for peak loads to supplement natural gas transported by pipeline. Transported by barge or tanker, liquefied natural gas may utilize isolated sources of natural gas having no pipeline outlets and may supply consuming centers with natural gas. In 1954, such a project was under way to transport Louisiana natural gas to Chicago by river barge, and the utilization of natural gas now being wasted in the Middle East -- by liquefaction and transportation to Europe by tanker -- is being studied. 32/

10. Proved Reserves.

Proved reserves of petroleum in the US, as estimated annually by the reserves committees of the American Petroleum Institute (API) and the American Gas Association (AGA), include only the crude oil, natural gas liquids, and natural gas recoverable from known deposits under existing economic and operating conditions. Proved reserves are both drilled and undrilled, but to be included the undrilled reserves must be so close and so related to the drilled reserves that there is every reasonable probability of their being recoverable by drilling as estimated. 33/

Comment on 10:

Estimates of the annual proved reserves of crude oil in the US have been published beginning with 1900. 34/ Beginning with 1946, the annual proved reserves of all three components of petroleum (crude oil, natural gas liquids, and natural gas) have been published jointly by the American Petroleum Institute (API) and the American Gas Association (AGA). 35/

Various estimates of proved reserves of crude oil of the world, by countries or major regions, have been published. 36/ Such estimates of proved reserves for foreign countries are usually based on the same concepts of proved reserves as are used in the US and defined in this research aid. Their probable accuracy, however, is somewhat less than that for the US estimates of proved reserves.

11. Petroleum Resources.

The petroleum resources of a country or region represent the estimated ultimate quantity of petroleum which may be found and recovered in the country or region. The petroleum resources thus include the petroleum produced to date, or cumulative production; the current proved reserves; and the estimated recoverable quantities of petroleum in deposits not yet discovered. 37/

Until recent years, estimates of petroleum resources were largely qualitative rather than quantitative because of lack of established and recognized techniques for making quantitative estimates of the remaining undiscovered petroleum deposits. Such techniques have now been developed and are being used to an ever-increasing extent. 38/

Thus far, most published estimates of petroleum resources have been made in terms of the crude oil component only. This is the result of the fact that historically the natural gas and natural gas liquids have been wasted on a very large scale. In some regions having no outlet, such as the Middle East, natural gas is still being "flared," or wasted. The remaining potential petroleum resources of a region can be estimated for all three components by selective analogy with proved reserves of these components in regions of the US. Source 39/ gives the proved reserves in the US of all three components by individual states.

Group B. Glossary of Terms Used in the Manufacturing Phase of the Petroleum Industry (ORR Standard Classification 32).

Definitions in this group are not taken from specific sources. Rather they have been formulated by reference to several recognized sources. These sources are listed in Appendix A, Selected Bibliography, under a subheading identifying them with this group.

12. Petroleum Products (ORR Standard Classification 321).

Petroleum products are useful products derived from petroleum (1) and synthetic petroleum (47) in forms suitable for final consumption.

Petroleum products are mostly liquids and gases but some semisolids and solids are included. Nongaseous petroleum products are predominantly produced by the manufacturing phase of the petroleum industry, including the synthetic petroleum industry. Some products such as finished gasoline (7) and some LPG (6) (35) are derived directly from the extractive phase of the petroleum industry and are consumed without any intermediate processing. Natural gas (3) (36) is the principal gaseous petroleum product. It is derived exclusively from the extractive phase of the petroleum industry. Crude oil (2) is used to a limited extent directly as a fuel without processing and in this sense may be classified as a petroleum product.

13. Aviation Gasoline (ORR Standard Classification 3211).

Aviation gasoline is gasoline suitable for use in airplane piston-type engines using gasoline as fuel. It is generally more volatile than motor gasoline. Rigorous specifications for high-octane rating, low freezing point, and other desirable characteristics identify the various grades of aviation gasoline.

14. Motor Gasoline (ORR Standard Classification 3212).

Motor gasoline embraces all gasolines not specifically identified as aviation gasoline (13). It is the principal fuel for spark-ignition internal combustion engines of the piston type, commonly used in automobiles, in some other types of mobile equipment, and in some stationary engines. Specifications for the various grades of motor gasoline cover octane rating, volatility range, and chemical quality.

15. Distillate Products.

Distillate products are liquid petroleum products within the boiling-point ranges of the condensates or distillates normally produced by distillation in petroleum refining. The principal distillate products are gasolines (13) (14); jet fuel (17); ligroine (18); kerosines (20) (21) (22); diesel fuels (24) (25); distillate fuel oils including gas oils (26) (27); and distillate lubricating oils (28), including the associated distillate paraffin wax, noting that lubricating oils may be mixed with thickening agents to form lubricating greases.

16. Light Distillate Oils (ORR Standard Classification 3213).

Under the ORR Standard Classification, light distillate oils are the light distillates excluding the gasolines (13) (14). They include jet fuel (17); ligroine (18); and kerosines (20) (21) (22). As the terms light distillates or light distillate products normally include gasoline, these terms should be carefully distinguished from light distillate oils as classified in the ORR Standard Classification.

17. Jet Fuel (ORR Standard Classification 32131).

Jet fuel is a light distillate product (15) (16) used as fuel for turbo-jet aircraft engines. In the US, various grades of jet fuel designated JP-1, JP-3, JP-4, and JP-5 are listed. 40/ The JP-1 specifications can be met only with a straight-run kerosine of select quality and limited availability. The specifications for JP-3 are much more liberal and permit the use of a blend of gasoline with kerosine, where the kerosine need not be of the straight-run type. It is estimated that as much as 60 percent of the volume of Free World crude oil can be derived as JP-3 jet fuel if proper refining techniques are applied. 41/

18. Ligroine (ORR Standard Classification 32132).

Ligroine is a term used principally in the USSR to denote a light distillate product (15) (16) used as a fuel for tractors having spark-ignition, piston-type, internal combustion engines. Except for its high end boiling point of about 450°F -- which is above the normal gasoline end boiling point -- ligroine corresponds to a heavy, low-octane gasoline of low volatility. The term has been used in the Free World to a very limited extent to designate certain types of light distillate oils (16).

19. Kerosine.

Kerosine is a light distillate oil (16) with an extreme boiling-point range, from about 300°F to 600°F. It is manufactured to various specifications to meet varied uses, such as lamp kerosine (20), tractor kerosine (21), and heating kerosine (22).

20. Lamp Kerosine (ORR Standard Classification 32133).

Lamp kerosine is the best grade of kerosine, meeting rigorous specifications for use in wick-burner lamps. Allowable smoking, wick char, and odor, together with proper volatility, chemical purity, and burning characteristics, comprise the critical specifications. Lamp kerosine is also known as lamp oil, illuminating oil, and the like.

21. Tractor Kerosine (ORR Standard Classification 32134).

Tractor kerosine is a light distillate oil (16) used primarily as a fuel for tractor engines of the spark-ignition internal combustion type. It may be a kerosine (19) or a blend of kerosine and gasoline (14). Tractor kerosine is heavier and generally lower in octane number than ligroine (18).

22. Heating Kerosine (ORR Standard Classification 32135).

Heating kerosine is a kerosine (19) used primarily as a fuel for cookstoves and small space heaters. It generally has a higher end boiling point and less rigorous specifications than lamp kerosine (20).

23. Heavy Distillate Oils (ORR Standard Classification 3214).*

Heavy distillate oils are distillate products (15) in the higher boiling-point ranges classified as diesel fuel (24); motor fuel or heavy diesel fuel (25); distillate fuel oils (26); and gas oils (27). These are heavy distillate products in the boiling-point range between kerosine (19) and lubricating oils (28). This definition by boiling-point range, however, is not exact, as diesel fuel overlaps in its lower boiling-point range into light distillate oils (16), and as gas oils overlap into the light lubricating oils (28).

24. Diesel Fuel (ORR Standard Classification 32141).

Diesel fuel is a heavy distillate oil (23) used as a fuel for diesel or semidiesel engines. For this particular classification it denotes a light diesel fuel or high-speed diesel fuel. It has a lower boiling point than motor fuel (25) and is of better quality because of specifications for high-cetane number and chemical purity.

* Also called gas oil products.

25. Heavy Diesel Fuel (Motor Fuel) (ORR Standard Classification 32142).

Heavy diesel fuel is a heavy distillate oil (23) used as a fuel for low-speed diesel engines and semidiesel engines. Heavy diesel fuel has a higher boiling-point range than light diesel fuel (24) and sometimes includes residuals (29). It is the typical marine diesel fuel. In Russian terminology, motor fuel is sometimes used as a term for heavy diesel fuel.

26. Distillate Fuel Oils (ORR Standard Classification 32143).

Distillate fuel oils are heavy distillate oils (23) with a relatively high boiling-point range. They are used primarily in burners and combustion chambers for heat generation. Distillate fuel oils may include heavy diesel fuel (25), and these two classes are sometimes used interchangeably, as their characteristics are very similar. Their differences are defined largely by usage rather than by specifications.

27. Gas Oils, including Solar Oil (ORR Standard Classification 32144).

The term gas oil may be used instead of solar oil, but it should not be confused with gas oil products, which are the same as heavy distillate oils (23). More specifically, gas oil refers to a heavy distillate oil (23) of the same type as solar oil (Soviet usage) but used for the enrichment of manufactured gas.

Solar oil is a term used in the USSR to denote heavy distillate oil (23) of relatively low boiling point and of relatively good quality primarily used as low-speed diesel fuel (24).

Solar oil was a term formerly used to denote a synthetic illuminating oil derived from shale oil. The term engine solar oil has been used to denote a specific diesel fuel which was also known as gas oil. These terms were formerly used when diesel engines were commonly called oil engines, but all of this terminology is now considered obsolete.

28. Lubricants (ORR Standard Classification 3215).

Broadly defined, a lubricant may be any substance used to reduce friction and wear between rubbing surfaces. Under this classification the definition of lubricants is restricted to those petroleum products (12) used as lubricants. They are of two broad types -- lubricating oils (liquids) and lubricating greases (pastes, semisolids, and solids). Lubricants comprise the second most important group of commercial petroleum products, the most important types being fuels.

29. Residuals (ORR Standard Classification 3216).

Residuals constitute an important class of petroleum products (12) which are here defined in terms of (a) crude residue, (b) residual or residue, and (c) residuals in terms of crude residue, residual or residue, and mazut.

a. Crude Residue (Also Called Crude Oil Residue, Topped Crude or Topped Crude Oil, and Reduced Crude or Reduced Crude Oil).

Crude residue is the higher boiling liquid portion of crude oil (2) in which no essential change in chemical composition has occurred. It is that portion remaining after removal, by distillation or otherwise, of the more volatile components.

Long residue is designated as the portion remaining after the removal of the lighter components of gasolines through kerosines.

Short residue is designated as the portion remaining after the removal of all distillate products (15) but only up to a point where sufficient heavy oil remains to form a heavy viscous residual liquid mixture.

b. Residual or Residue.

Unless otherwise specifically defined in context, the terms residual or residue denote any short residue and any other petroleum stock physically similar to short residue. As thus defined, they include material that may be of petroleum or of synthetic petroleum origin, and they therefore may include material which has been subjected to chemical change in composition.

c. Residuals in Terms of Crude Residue, Residual or Residue, and Mazut.

Residuals in terms of crude residue, residual or residue, and mazut are any crude residues as defined in a, above, and any petroleum products (12) of the type designated short residue, whether from petroleum or synthetic petroleum as defined in b, above. The latter types are viscous liquids called mazut in the USSR. They are principally residual fuel oils (30), road oils (33), and bituminous tars (33).

Residuals also include certain semisolids and solids such as paraffin waxes (33); asphalt, pitch, and bitumen (31); and petroleum coke (32). This inclusion is somewhat arbitrary, since certain paraffin waxes are derived as distillate products and since certain lubricating oils are residual products.

30. Residual Fuel Oils (including Mazut) (ORR Standard Classification 32161).

Residual fuel oils are residuals (29) comprising a heavy liquid petroleum product (12) with a high boiling point primarily used as fuel for direct heating in furnaces, under boilers, and in other suitable burners and combustion chambers. Industrial fuel oil and steamship bunker fuel oil are residual fuel oils.

31. Asphalts and Bitumens (ORR Standard Classification 32162).

a. Asphalt.

Asphalt is a residual (29) petroleum product (12). It is a dark-brown-to-black fusible solid or semisolid at normal temperatures. It is used as a surfacing agent, particularly for paving. Native asphalt, mined from natural deposits, is also used in the same manner, although it usually contains associated mineral matter. Pitch is a material physically similar to asphalt and is also called bitumen. Typically, it is derived from synthetic petroleum.

b. Bitumen.

Pending necessary clarification of conflicting published definitions, bitumen should be defined according to the context in which it is used. Recommended usage defines bitumen as a residual (29) petroleum product (12). As such, it is a solid residual, similar to asphalt and pitch. The term bitumen is preferred to pitch when applied to a material derived from petroleum.

32. Petroleum Coke (ORR Standard Classification 32163).

Petroleum coke is a residual (29) petroleum product (12) obtained as a nearly pure solid carbon by destructive distillation (intensive cracking with advanced chemical decomposition). It is an infusible, cellular, coherent solid produced in several grades. Its chief uses are for electrodes and as a fuel.

33. Residuals Such As Road Oils and Tars, Not Elsewhere Classified (ORR Standard Classification 32169).

Under this classification, three materials will be defined -- bituminous tar, road oils, and paraffin waxes.

a. Bituminous Tar.

Bituminous tar is a residual (29) petroleum product (12) obtained in petroleum refining, in carbonization (destructive distillation) of coal or lignite, and sometimes in other primary synthetic oil processing. It is a viscous dark-brown-to-black liquid with a high boiling point. Bituminous tar is used commercially as a surfacing, covering, binding, and filling agent.

b. Road Oils.

Road oils are classified as residual (29) petroleum products (12) used chiefly in road surfacing. Two types are recognized -- asphaltic road oil and nonasphaltic road oil. Asphaltic road oil may be either a residual (29) or a heavy, unrefined crude oil (2). It is used chiefly as a binder for mineral aggregates used in road surfacing. Nonasphaltic road oil may be either a residual (29) or a distillate product (15) derived either from petroleum or from synthetic petroleum. It is used chiefly to lay dust at the road surface.

c. Paraffin Waxes.

Paraffin waxes constitute a group of petroleum products (12) classified herein as residuals (29) of varying types and uses. Paraffin wax is described as a colorless, translucent material, crystalline when separating from solution, odorless and tasteless, slightly greasy to the touch, and consisting of solid hydrocarbons of the paraffin type. It has a low melting point and has many uses -- for candles, wax polishes, and ointments and for sealing, coating, preserving, and molding. Microcrystalline wax, sometimes called petrolatum, is a finer textured paraffin wax with special uses. Petrolatum is also used to designate an ointment composed of paraffin wax mixed with heavy residual oil. Ozokerite is a solid petroleum (1) found in native deposits and is related to paraffin wax. Ceresin is refined ozokerite. It has special use in wax polishes.

34. Refinery Gas (ORR Standard Classification 3217).

Refinery gas is a gaseous petroleum product (12) composed of a mixture of "still" gases, derived principally from conversion processes such as cracking and reforming, and is used as a fuel gas after the removal of the condensable hydrocarbons as liquefied refinery gases, or LPG (35).

35. Liquefied Petroleum Gas, or LPG (as a Petroleum Product) (ORR Standard Classification 3218).

Liquefied petroleum gas, or LPG, has been previously defined (6) as a subcomponent of natural gas liquids (4), which are one of the three components of petroleum obtained in the extractive phase of the petroleum industry (ORR Standard Classification 13).

As a petroleum product, LPG is used directly by consumers. LPG derived from the extractive phase of the petroleum industry is supplemented by liquefied petroleum gases derived from refineries and designated liquefied refinery gases to distinguish the two sources of LPG. From the point of view of utilization, however, they are indistinguishable. 42/

The use of LPG is rapidly expanding in the US and in other countries. Sales of LPG in the US show the principal classes of uses to be domestic, commercial, and chemical and for synthetic rubber, internal combustion engines, and gas manufacturing. 43/

36. Natural Gas (as a Petroleum Product) (ORR Standard Classification 321).

Natural gas has been previously defined (3) as a component of petroleum production in the extractive phase of the petroleum industry (ORR Standard Classification 13).

Natural gas is by far the most important gaseous petroleum product. Refinery gas (34) is of minor significance.

Consumption of natural gas is rapidly expanding in the US and some other countries. In those oil-producing areas such as the Middle East, where huge quantities of natural gas produced with crude oil are being wasted because of lack of outlets, it is likely that current studies for utilization will result in a great expansion of natural gas consumption in the future.

In addition to its widespread use as a fuel for residential and commercial heating and cooking, natural gas is used in the US in large quantities for various industrial uses such as the manufacture of carbon black; Portland cement; and petrochemicals, particularly fertilizers. It may also be synthesized with other raw materials to produce synthetic gasoline and other products. Some natural gases carry small percentages (up to 7 percent) of helium. Such natural gases are the only source of commercial helium in the US.

37. Shale Oil and Gas (ORR Standard Classification 322).

Shale oil and gas are petroleum products (12) obtained from sedimentary rocks, of widely varying characteristics, called oil shale because of their organic content. The oil shale is mined and retorted, yielding shale oil and gas by destructive distillation of the organic matter in the shale. Generally, shale oil and gas are of inferior quality compared with crude oil and natural gas, but their utilization is justified in certain parts of the world lacking in petroleum. In the US the oil shales are considered to be a valuable potential resource which may be needed eventually to supplement petroleum resources (11).

Group C. Glossary of Miscellaneous Terms Used in the Petroleum Industry.

Many of the definitions given in Group C are documented by reference to specific sources but are not direct quotations from those sources. The remaining definitions for which no documentation is shown are derived from the same sources used for formulating the definitions in Group B and so designated in Appendix A, Selected Bibliography.

38. Specific Gravity (Sp Gr).

Specific gravity is "The ratio of the weight of a volume of a body to the weight of an equal volume of some standard substance. In the case of liquids and solids, the standard is water; and in the case of gases, the standard is hydrogen or air. ... Practically, in the case of oils, the specific gravity is determined through the use of a hydrometer." 44/

Comment on 38:

In the US petroleum industry the specific gravity is referred to water at 60°F, which is assumed to weigh 8.32828 pounds per gallon, 45/ except for gases, which are referred to air at 60°F, which is assumed to weigh 76.37 pounds per thousand cubic feet. 46/

39. API Gravity.

API gravity is "An arbitrary scale expressing the gravity or density of liquid petroleum products. The measuring scale is calibrated in terms of 'API' degrees. It may be calculated in terms of the following formula:

$$\text{deg API} = \frac{141.5}{\text{sp gr } 60/60\text{ F}} - 131.5\text{"}$$ 47/

40. Consumption.

As indicated under total demand (46), consumption implies more detailed information on secondary and consumers' stock changes than is normally available for aggregation by the Bureau of Mines. Although it is used interchangeably with demand from time to

time, consumption more frequently is used with reference to such specific products and specific consumers as consumption of gasoline by farm tractors or consumption of fuel oils by public utilities. 48/

41. Domestic Demand.

Domestic demand is total demand (46) less exports (42). Bunker loadings are included in the domestic demand of the country where the loading occurs and are not classified as exports. 49/

42. Exports.

Exports are total shipments from the continental US, including shipments to US territories and possessions. 50/ Bunker loadings are included in the domestic demand (41) of the country where the loading occurs and are not classified as exports.

43. New Supply.

New supply is the sum of crude oil production, natural gas liquids production, and benzol (coke-oven) production used for motor fuel, and imports of crude oil and petroleum products. 51/ It is to be noted that oils produced from nonpetroleum sources would be included if produced in commercial quantity.

44. Petroleum Stockpile.

Petroleum stockpile consists of the quantity of petroleum products in storage facilities that is in excess of normal working inventories and that is designated for future emergency use.

45. POL.

POL is a broad term including all petroleum products used by the Armed Forces. It originated as an abbreviation for petrol, oil, and lubricants. 52/

Comment on 45:

This term is not generally used in the US petroleum industry.

46. Total Demand (Disposal).

Total demand is a derived figure representing total new supply (43) plus decreases or minus increases in reported stocks. Because there are substantial secondary and consumers' stocks that are not reported by the Bureau of Mines, this figure varies considerably from consumption (40). 53/

47. Synthetic Petroleum.

Synthetic petroleum is a commercially derived material, predominantly composed of hydrocarbons, but it does not occur naturally as such and is not derived from petroleum (1) as raw material. In the over-all chemical sense, petroleum (1) and synthetic petroleum are varieties of a single class of materials from which all petroleum products (12) are derived.

Synthetic petroleum stocks may be solid, liquid, or gaseous, but the liquid type, called synthetic oil stocks or synthetic oils, is by far the most important.

Almost all commercial synthetic petroleum is directly or indirectly derived either from oil shale or from the coal-lignite type of raw material.

II. Selected Quantitative Conversion Factors and Energy Equivalents for the World Petroleum Industry.

Introduction.

The conversion factors presented herein are selected on the basis of most frequent use. For other factors, refer to the publications listed in Appendix A, Selected Bibliography.

Conversion factors are given in periods of three significant figures beyond the decimal point for use in locating the decimal point in conversion calculations on standard calculating machines.

Group A. Basic Conversion Units of Measurement. 54/

1. Units of Length.

Multiply	by	To obtain
Feet	0.304801	Meters
Meters	3.280833	Feet
Miles	1.609347	Kilometers
Kilometers	0.621370	Miles

2. Units of Area.

Multiply	by	To obtain
Square feet	0.092903	Square meters
Square meters	10.764	Square feet
Square miles	2.590	Square kilometers
Square kilometers	0.386101	Square miles
Acres	0.404687	Hectares
Hectares	2.471	Acres

3. Units of Volume.

Multiply	by	To obtain
Cubic feet	0.028317	Cubic meters
Cubic meters	35.314	Cubic feet
Gallons*	3.785	Liters
Liters	0.264178	Gallons

* Gallons denotes US gallons.

3. Units of Volume (Continued).

Multiply	by	To obtain
Gallons 55/	0.023810	Barrels*
Barrels 56/	42.000	Gallons
Cubic feet	0.178108	Barrels
Barrels	5.615	Cubic feet
Cubic meters	6.290	Barrels
Barrels	0.158988	Cubic meters
Imperial gallons 57/	1.201	Gallons
Gallons	0.832682	Imperial gallons

4. Units of Weight.

Multiply	by	To obtain
Pounds**	0.453592	Kilograms
Kilograms	2.205	Pounds
Metric tons	2,204.622	Pounds
Metric tons	1.102311	Short tons
Metric tons	0.984206	Long tons

* Barrels denotes US barrels.
** Pounds denotes avoirdupois pounds.

Group B. Gravities and Conversion Factors for Petroleum and Its Components.

The densities of the components of petroleum -- crude oils, natural gas liquids, and natural gases -- vary within certain limits, depending upon the composition and distribution of the components in the underground deposits and upon the production practices and field processes used in each field or area.

The average density of petroleum components produced in a given district, state, or country will change gradually with changes in their source distribution. Thus a newly discovered, prolific deposit having a density radically different from the remaining deposits in the area will affect significantly the average density of the area. Also, slight changes in density are usually noted in the petroleum components produced from the same deposit as it approaches depletion.

1. Crude Oils.

The specific gravity of crude oil is based upon the weight of water at 60°F, which is assumed to be 8.32828 pounds per gallon. The specific gravity of a given crude oil is the ratio of the weight of 1 gallon of the oil to 1 gallon of water at 60°F -- that is, 8.32828 pounds. 58/

Crude oil gravities are usually measured and expressed in degrees API gravity, as defined in Section I. Source 59/ has been used herein for conversion of specific gravity to API gravity.

a. United States.

Area, Year, and Source	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
US average:					
1916 a/ range from	0.768	52.7	6.394	8.207	0.121852
to	0.996	10.6	8.295	6.328	0.158026

a. 60/

a. United States (Continued).

Area, Year, and Source	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
1921 average a/	0.865	32.0	7.203	7.286	0.137242
1927 average a/	0.864	32.3	7.194	7.295	0.137083
1950 average b/	0.866	31.9	7.211	7.274	0.137476
1952 average c/	0.850	35.0	7.078	7.418	0.134807
1953 average d/	0.850	35.0	7.078	7.418	0.134807
1954 average e/	0.854	34.2	7.111	7.378	0.135544
Lowest US API gravity:					
Alabama e/	0.929	20.8	7.736	6.783	0.147428
Highest US API gravity:					
Michigan e/	0.811	43.0	6.752	7.773	0.128658
Principal US oil-producing states e/:					
Texas	0.844	36.2	7.028	7.470	0.133889
California	0.901	25.6	7.503	6.999	0.142874

a. 61/
b. 62/
c. 63/
d. 64/
e. Calculated weighted average specific gravity computed from selected data. 65/

a. United States (Continued).

Area, Year, and Source	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
Louisiana	0.851	34.8	7.086	7.404	0.135068
Oklahoma	0.845	36.0	7.036	7.462	0.134005
Kansas	0.841	36.8	7.002	7.495	0.133418
b. Other Countries.					
Albania, 1953 a/	0.945	18.2	7.870	6.672	0.149880
Argentina, 1953 a/	0.898	26.1	7.478	7.021	0.142430
Austria, 1953 a/	0.929	20.8	7.736	6.788	0.147319
Bahrein, 1953 a/	0.858	33.4	7.144	7.350	0.136054
British Borneo, 1953 a/	0.843	36.4	7.019	7.480	0.133690
Canada, 1953 a/	0.850	35.0	7.078	7.418	0.134807
Colombia, 1953 a/	0.895	26.6	7.453	7.039	0.142066
Czechoslovakia, 1953 a/	0.929	20.8	7.736	6.782	0.147449
Egypt, 1953 a/	0.909	24.2	7.569	6.931	0.144279
France, 1953 a/	0.909	24.2	7.569	6.930	0.144300
Germany, West, 1953 a/	0.890	27.5	7.411	7.084	0.141163

a. 66/

b. Other Countries (Continued).

Area, Year, and Source [a]	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Conversion Factors: Barrels per Metric Ton	Conversion Factors: Metric Tons per Barrel
Hungary, 1953	0.826	39.8	6.877	7.630	0.131062
India, 1953	0.871	31.0	7.253	7.239	0.138141
Indonesia, 1953	0.852	34.6	7.094	7.396	0.135208
Iran, 1953	0.838	37.4	6.978	7.517	0.133032
Iraq, 1953	0.843	36.4	7.019	7.476	0.133761
Italy, 1953	0.821	40.9	6.836	7.677	0.130259
Japan, 1953	0.884	28.6	7.361	7.131	0.140233
Kuwait, 1953	0.865	32.1	7.203	7.284	0.137287
Mexico, 1953	0.884	28.6	7.361	7.132	0.140213
Netherlands, 1953	0.907	24.5	7.553	6.952	0.143843
Pakistan, 1953	0.840	37.0	6.994	7.506	0.133227
Peru, 1953	0.838	37.4	6.978	7.517	0.133032
Poland, 1953	0.850	35.0	7.078	7.419	0.134789
Qatar, 1953	0.823	40.4	6.852	7.659	0.130565
Rumania, 1953	0.846	35.8	7.044	7.453	0.134173
Saudi Arabia, 1953	0.843	36.4	7.019	7.474	0.133797
Trinidad, 1953	0.890	27.5	7.411	7.079	0.141263

a. 67/

b. Other Countries (Continued).

Area, Year, and Source	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
Turkey, 1953 a/	0.934	20.0	7.778	6.749	0.148170
USSR, 1950 a/	0.867	31.7	7.219	7.266	0.137627
Venezuela, 1953 b/	0.898	26.1	7.478	7.020	0.142450
South America, 1953 c/	0.896	26.4	7.461	7.037	0.142106
Middle East, 1953 c/	0.850	35.0	7.078	7.413	0.134898
Soviet Bloc, 1953 c/	0.869	31.3	7.236	7.252	0.137893
Free World, 1953 c/	0.859	33.2	7.153	7.341	0.136221
Total World, 1953 c/	0.860	33.0	7.161	7.333	0.136370

a. 68/
b. 69/
c. Weighted average values. Based on specific gravity values derived from sources 70/ and 71/ and applied to 1953 production as given in source 72/.

2. Natural Gas Liquids.

The specific gravity of natural gas liquids is based upon the same standard as crude oil -- that is, the weight of water at 60°F, assumed to be 8.32828 pounds per gallon.

The specific gravities of natural gas liquids are frequently expressed in degrees API gravity, as with crude oil.

Natural gas liquids as produced in field separators, scrubbers, natural gasoline, and cycling plants comprise four principal subcomponents: natural gasoline, finished gasoline, liquefied petroleum gases (LPG), and other products.

US production statistics on LPG show six classes of products: commercial butane-propane mixture, normal butane, propane, other mixtures (LPG), iso-butane, and iso-pentane.

The average specific gravity of natural gas liquids produced in a given area for a given period will depend upon the distribution of the subcomponents listed above. The specific gravities of the basic components as determined by the Natural Gasoline Association of America 73/ have been applied to the US production 74/ of the subcomponents listed above for the years 1947-53 to obtain the specific gravities and conversion factors listed below:

Component or Subcomponent of Petroleum	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Conversion Factors: Barrels per Metric Ton	Conversion Factors: Metric Tons per Barrel
Natural gas liquids	0.630	93.1	5.243	10.001	0.099987
Natural gasoline	0.674	78.4	5.610	9.355	0.106890
Finished gasoline	0.700	70.6	5.827	9.003	0.111070
LPG	0.546	127.7	4.547	11.545	0.086618
Other products	0.774	51.3	6.444	8.148	0.122726

3. Natural Gases.

Natural gas is measured volumetrically under specified standard conditions. In the US the American Gas Association specifies these standard conditions as a pressure of 1 atmosphere, which is assumed to be 14.65 pounds per square inch absolute, and a temperature of 60°F. 75/ The specific gravity of natural gas is based upon the weight of dry air under these standard conditions, or 76.37 pounds per thousand cubic feet. 76/

Natural gas, as defined in Section I, is derived from three sources, designated Dissolved, Associated, and Nonassociated (see below). In the US, natural gas reserves are estimated separately from these three sources. 77/ The 1948 production of natural gas in the US from these three sources, together with data on the composition of the natural gases produced, was published by the US Corps of Engineers, based upon an exhaustive independent survey. 78/ From these data the weighted average specific gravities of natural gases from these three sources have been computed, as follows:

Source of Component	Specific Gravity (Air = 1.0)	Conversion Factors: Metric Tons per Million Cubic Feet	Conversion Factors: Metric Tons per Million Cubic Meters	Conversion Factors: Cubic Meters per Metric Ton
Dissolved	0.680	23.549	832	1,202
Associated	0.650	22.532	796	1,257
Nonassociated	0.612	21.196	749	1,336
Average US	0.646	22.379	790	1,265

The specific gravity of "wet," or "rich," natural gas -- natural gas as extracted from the underground deposit before separation of the natural gas liquids -- is normally higher than the values given above for natural gas. Some specific gravities have been reported ranging from 1.37 to 1.66 (air = 1.0) because of the high content of natural gas liquids. 79/ Based on data on natural gas treated for recovery of natural gas liquids in the US 80/ and on other recovery studies, 81/ the average specific gravity of wet natural gas in the US before the separation of the natural gas liquids is 0.719 (air = 1.0) for the 7-year period 1947-53. The natural gas liquids recovered represented 13.71 percent by weight of the wet natural gas treated.

Group C. Gravities and Conversion Factors for Petroleum Products.

The densities of petroleum products vary within fairly well-recognized limits. For example, the normal range of specific gravities for motor gasolines is from 0.704 to 0.755. 82/ However, motor gasoline with a specific gravity as high as 0.770 has been reported. 83/

The specific gravity of liquid petroleum products is based on the weight of water at 60°F, in the same manner as crude oil. Also like crude oil, the API gravity rather than the specific gravity is most widely used.

1. Liquid Petroleum Products Specifically Identified. 84/

Product and Grade Average Value and Range of Values	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
Aviation Gasolines					
Grade 115/145 average	0.701	70.3	5.837	8.994	0.111253
Range from	0.717	65.8	5.970	8.792	0.113792
to	0.687	74.5	5.718	9.180	0.108984
Grade 100/130 average	0.712	67.2	5.928	8.855	0.112983
Range from	0.729	62.6	6.068	8.650	0.115664
to	0.688	74.2	5.726	9.167	0.109143
Grade 91/96 average	0.708	68.4	5.892	8.909	0.112316
Range from	0.725	63.7	6.034	8.699	0.115013
to	0.697	71.5	5.802	9.047	0.110587
80-octane average	0.716	66.1	5.961	8.806	0.113617
Range from	0.721	64.7	6.004	8.742	0.114426
to	0.695	72.1	5.785	9.074	0.110269

1. Liquid Petroleum Products Specifically Identified (Continued).

Product and Grade Average Value and Range of Values	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
Motor Gasolines					
80-octane average	0.733	61.5	6.103	8.601	0.116330
Range from	0.747	58.0	6.261	8.444	0.118472
to	0.728	63.0	6.056	8.668	0.115426
74-octane average	0.739	60.0	6.151	8.534	0.117235
Range from	0.745	58.5	6.199	8.468	0.118155
to	0.704	69.5	5.860	8.958	0.111697
All others average	0.747	58.0	6.216	8.444	0.118472
Range from	0.755	56.0	6.283	8.354	0.119742
to	0.708	68.0	5.904	8.891	0.112316
Jet Fuels					
JP-1 average	0.792	47.2	6.592	7.963	0.125628
Range from	0.833	38.3	6.939	7.565	0.132212
to	0.708	68.4	5.892	8.909	0.112316
JP-3 average	0.763	54.0	6.350	8.266	0.121027
Range from	0.802	45.0	6.675	7.864	0.127199
to	0.728	63.0	6.056	8.667	0.115426

1. Liquid Petroleum Products Specifically Identified (Continued).

Product and Grade Average Value and Range of Values	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
Jet Fuels (Continued)					
JP-4 average	0.795	46.5	6.618	7.931	0.126120
Range from	0.825	40.0	6.870	7.641	0.130911
to	0.747	58.0	6.216	8.445	0.118472
JP-5 average	0.820	41.0	6.830	7.685	0.130150
Range from	0.850	35.0	7.076	7.417	0.134846
to	0.780	50.0	6.491	8.088	0.123692
Solvents and Naphthas					
Cleaning solvent average	0.788	48.0	6.563	7.998	0.125073
Range from	0.802	45.0	6.675	7.864	0.127199
to	0.759	55.0	6.316	8.310	0.120376
Other naphthas average	0.731	62.0	6.087	8.623	0.116029
Range from	0.780	50.0	6.490	8.088	0.123692
to	0.689	74.0	5.731	9.159	0.109254

1. Liquid Petroleum Products Specifically Identified (Continued).

Product and Grade Average Value and Range of Values	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
Kerosine Average	0.816	42.0	6.790	7.731	0.129388
Range from	0.830	39.0	6.910	7.602*	0.131673
to	0.797	46.0	6.637	7.909	0.126485
Distillate Fuel Oils					
50-cetane diesel average	0.845	36.0	7.034	7.462	0.134037
Range from	0.855	34.0	7.119	7.373	0.135655
to	0.840	37.0	6.993	7.506	0.133244
40-cetane diesel average	0.845	36.0	7.034	7.462	0.134037
Range from	0.857	33.6	7.137	7.355	0.135988
to	0.837	37.6	6.968	7.533	0.132768
All others average	0.845	36.0	7.034	7.462	0.134037
Range from	0.860	33.0	7.163	7.328	0.136480
to	0.835	38.0	6.951	7.552	0.132450

* Correction of error in source.

1. Liquid Petroleum Products Specifically Identified (Continued).

Product and Grade Average Value and Range of Values	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
Residual Fuel Oils					
Navy special average	0.947	18.0	7.882	6.660	0.150173
Range from	0.985	12.1	8.206	6.397	0.156345
to	0.925	21.4	7.706	6.812	0.146825
All others average	0.986	12.0	8.212	6.392	0.156456
Range from	1.052	3.0	8.762	5.991	0.166911
to	0.904	25.0	7.529	6.972	0.143461
Lubricating Oils					
Aviation average (reciprocating engines)	0.889	27.7	7.401	7.092	0.141018
Range from	0.895	26.6	7.453	7.043	0.142002
to	0.885	28.4	7.368	7.124	0.140399
Aviation (jet) average	0.878	29.6	7.314	7.177	0.139352
Range from	0.878	29.6	7.314	7.177	0.139352
to	0.878	29.6	7.314	7.177	0.139352

1. Liquid Petroleum Products Specifically Identified (Continued).

Product and Grade Average Value and Range of Values	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
Lubricating Oils (Continued)					
Diesel engine average	0.897	26.3	7.467	7.030	0.142271
Range from	0.908	24.3	7.563	6.941	0.144096
to	0.891	27.4	7.415	7.079	0.141288
Other heavy duty average (internal combustion engines)	0.893	27.0	7.434	7.061	0.141637
Range from	0.916	23.0	7.627	6.882	0.145318
to	0.871	31.0	7.251	7.239	0.138162
All others average	0.893	27.0	7.434	7.061	0.141637
Range from	0.898	26.0	7.481	7.017	0.142541
to	0.882	29.0	7.341	7.150	0.139876

1. Liquid Petroleum Products Specifically Identified (Continued).

Product and Grade Average Value and Range of Values	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
Insulating and Transformer Oils Average	0.876	30.0	7.296	7.194	0.139019
Range from	0.879	29.5	7.318	7.173	0.139447
to	0.868	31.5	7.228	7.262	0.137734
Fog Oil Average	0.845	36.0	7.034	7.462	0.134037
Range from	0.855	34.0	7.119	7.373	0.135655
to	0.840	37.0	6.993	7.506	0.133244

2. Average Values for Petroleum Products in International Trade. 85/

Product	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
Aviation gasoline	0.733	61.5	6.10	8.60	0.116
Motor gasoline	0.741	59.5	6.17	8.50	0.118
Natural gasoline	0.741	59.5	6.17	8.50	0.118
Kerosine	0.812	42.8	6.76	7.75	0.129

2. Average Values for Petroleum Products in International Trade (Continued).

Product	Specific Gravity	API Gravity	Conversion Factors: Pounds per Gallon	Barrels per Metric Ton	Metric Tons per Barrel
Gas oil, diesel oil, and distillate fuel oils	0.870	31.2	7.24	7.25	0.138
Residual fuel oils	0.946	18.1	7.88	6.66	0.150
Lubricating oils	0.901	25.6	7.50	7.00	0.143
Asphalt and road oil	1.038	4.8	8.65	6.06	0.165
Greases	1.000	10.0	8.33	6.30	0.159
Petroleum and wax	0.799	45.6	6.65	7.87	0.127
Petroleum coke	1.145	N.A.	9.54	5.50	0.182
Liquefied petroleum gas	0.580	112.5	4.83	11.60	0.086

Applying the foregoing factors to the output of petroleum products at refineries in the US, as given in source 86/, the weighted average values for petroleum products are as follows:

Specific gravity	0.825
API gravity	40.0
Pounds per gallon	6.87
Barrels per metric ton	7.64
Metric tons per barrel	0.131

Group D. Heat Values and Energy Equivalents for Petroleum and Petroleum Products.

1. Representative Heat Values.

Petroleum Component of Petroleum Product	Heat Values: Thousand BTU per Pound	Heat Values: Million BTU per Metric Ton
Crude oil a/	19.960	44.004
Natural gas b/	20.269	44.685
Natural gas liquids c/	21.300	46.958
Gasoline d/	20.500	45.195
Kerosine d/	19.800	43.652
Distillate fuel oils e/	19.600	43.211
Residual fuel oils d/	18.300	40.345
Average of above values	19.961	44.007

a. Conversion factors from source 87/ applied to world average crude oil gravity given in Group B, 1, b.
b. Conversion factor for natural gas given in source 88/ applied to average US natural gas as given in Group B, 3, a.
c. Average value for natural gas liquids subcomponents as given in source 89/.
d. 90/
e. 91/

An average heat value of 20,000 British thermal units (BTU) per pound or 44 million BTU per metric ton can be used for any petroleum component or product without introducing a maximum error of more than about 10 percent.

2. Energy Equivalents.

Assuming an average heat value of 44 million BTU per metric ton for petroleum and petroleum products, the following fuel equivalents are computed 92/:

One Metric Ton of		Metric Tons of Petroleum
Bituminous coal	Equals	0.656
Anthracite coal	Equals	0.681
Shale ore	Equals	0.100

The fuel demand for thermal electric power plants in the US per kilowatt-hour (kwh) of output was 18,340 BTU in 1939; 17,065 BTU in 1947; and a projected value of 11,377 BTU in 1965. 93/ As 1 kwh is equivalent to 3,413 BTU, these data indicate an over-all energy conversion efficiency of 18.6 percent in 1939, 20 percent in 1947, and 30 percent projected in 1965. Using the 1947 value of 17,065 BTU per kwh output, 1 metric ton of petroleum is equivalent to 2,578 kwh of electric power output, based on the assumption of 44 million BTU per metric ton for petroleum.

III. Glossary of Selected Russian Petroleum Terms.

The object of this very limited glossary is to focus the problem of translating certain Russian language petroleum terms into their equivalent English terms in the light of usage in the US petroleum industry. The dimensions of this problem are much greater than can be covered in this limited presentation. In fact, it is a continuing problem, the solution of which will require the continued cooperation of translators and petroleum technologists.

The basis for selection of the Russian terms in this glossary lies in the variation in the way these terms are treated in standard reference dictionaries and technical dictionaries. Selection has also been made where it is believed that available dictionaries and glossaries are imprecise or fail to render a definition. Terms on which all, or almost all, translators agree and which are acceptable from the point of view of usage in the US petroleum industry have not been included except when they modify or clarify other terms in the list.

Part of the difficulty in translating Soviet petroleum terminology into English lies in the fact that there is no comprehensive Russian-English petroleum dictionary. Among those dictionaries listed in Appendix D, the Sedykh dictionary 94/ is extremely helpful in the refining phase of the petroleum industry, but it is difficult to use, since the arrangement is English-Russian. The Allied Control Council glossary 95/ was a step in the direction of a comprehensive Russian-English dictionary, but it is far from comprehensive in the light of current usage of terminology in the Soviet petroleum industry.

Many of the listings under the "Preferred English Equivalent" column below have been deduced from postwar usage as observed in Soviet sources such as the petroleum journal Neftyanoye khozyaystvo, the newspaper Bakinskiy rabochiy, and various monographs. Where such deduction has been made, it has been noted in the comment column. The entry "Lit." in the "Source" column indicates that this is a possible literal translation of the Soviet term.

The preferred English equivalents are defined in Section I in instances where the meaning may be obscure. The listings in the "Preferred English Equivalent" column reflect current recommended usage unless the context indicates otherwise. More exhaustive study and consultation may indicate the desirability of changes in the recommended usage.

Finally, the importance of context is stressed. The listings in the "Preferred English Equivalent" column apply only in the context of Soviet petroleum literature. Entirely different meanings may be derived in different context. Even within Soviet petroleum literature the context may suggest different equivalents.

Transliterated Russian Term	English Equivalent as Expressed by Dictionary Listing or Literal Translation		Preferred English Equivalent	
	Term	Source	Term	Comment
Atmosfernaya razgonka	Air distillation Atmospheric distillation	96/ Lit.	Atmospheric distillation	
Davleniye u zaboya skvazhiny	Pressure at the stope of a well Bottom hole pressure	Lit. 97/	Bottom hole pressure	
Dobycha nefti	Extraction of petroleum	98/	Petroleum production	
			Crude oil production	a/*
Dvukhstvol'naya skvazhina	Dual-shaft well	Lit.	Twin well	Deduced
Eksploatatsionnoye bureniye	Exploitational drilling	Lit.	Development drilling	Deduced
Fontaniruyushchaya skvazhina	Gusher flowing well	99/ Lit.	Flowing well	
Gazovyy benzin	Gaseous gasoline Natural gasoline	Lit. 100/	Natural gasoline	

* Lettered comments follow on p. 55.

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Transliterated Russian Term	English Equivalent as Expressed by Dictionary Listing or Literal Translation		Preferred English Equivalent	
	Term	Source	Term	Comment
Glubokaya pererabotka (nefti)	Deep refining	Lit.	Intensive refining, wherein production of light-end products by such means as cracking is emphasized (no specific US equivalent)	Deduced
Glubokiy otbor (nefti)	Deep separation	Lit.		
Konsistentnyye smazki	Consistent greases Lubricating greases	Lit. 101/	Lubricating greases	
Kustovaniye skvazhin	The interconnecting of oil wells	Lit.	The grouping of directionally drilled oil wells around one drilling base	
Ligroin	Ligroine Ligroine Naphtha Naphtha	102/ 103/ 104/ 105/	Ligroine	b/
Mazut	Mazut Fuel oil Fuel oil Residual fuel oil	106/ 107/ 108/ 109/	Mazut	b/
Mnogoryadnyye skvazhiny	Polyserial wells Multiple series wells	Lit. Lit.	Multiple zone wells	Deduced

Transliterated Russian Term	English Equivalent as Expressed by Dictionary Listing or Literal Translation		Preferred English Equivalent	
	Term	Source	Term	Comment
Morskoy neftyanoy promysel	Marine or maritime oilfield	Lit.	Offshore oilfield	c/
Motornoye toplivo	Motor fuel	110/	Heavy diesel fuel	d/
	Motor fuel	Lit.		
Nagnetatel'naya skvazhina	Pressure well	Lit.	Input well or injection well	e/
Naklonennaya skvazhina	Inclined well	Lit.	Directional well or directionally drilled well	Deduced
Nasosnyye shtangi	Pump rods	Lit.	Sucker rods	
	Sucker rods	111/		
Neft'	Oil	112/	Petroleum or crude oil	f/
	Crude oil	113/		f/
	Petroleum	114/		
	Petroleum	115/		
	Naphtha	116/		
	Crude oil	117/		
	Petroleum	118/		
Neftyanoy promysel, nefte promysel	Oil business	Lit.	Oilfield	g/

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Transliterated Russian Term	English Equivalent as Expressed by Dictionary Listing or Literal Translation		Preferred English Equivalent	
	Term	Source	Term	Comment
Ochistka (nefte-produktov)	Treatment	119/	Treating	h/
	Treatment	120/	Refining	h/
	Refinement	121/		
	Cleansing	Lit.		
	Purification	Lit.		
Pererabotka (nefti)	Processing	122/	Processing	h/
	Refining	123/	Refining	h/
	Treatment	124/		
	Working over	Lit.		
Pervichnaya peregonka	Primary distillation	Lit.		
	Primary distillation	125/	Primary distillation	
	Topping	126/		
(Nefte) peregonnaya ustanovka	Topping unit	127/	Distillation unit	i/
	Oil refinery	128/		
	Distillation unit	Lit.	Topping unit	i/
Plastovaya voda	Water occurring below the petroleum layer	129/	Formation water	j/
Plastovaya neft'	Stratum oil	Lit.	Reservoir oil	j/
Podnyatiye (nefti) na poverkhnost'	Lifting to the surface	Lit.	Lifting operation	Deduced
(Poputnyy) neftyanoy gaz	Gasinghead gas	130/	Natural gas produced with crude oil	

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Transliterated Russian Term	English Equivalent as Expressed by Dictionary Listing or Literal Translation		Preferred English Equivalent	
	Term	Source	Term	Comment
Prisadka	Additive Dope Addition	131/ 132/ Lit.	Additive	k/
Prokhodka	Cutting	133/	Meterage drilled	l/
Propusknaya sposobnost' (nefte-pererabatyvayushchey apparatury)	Throughput Capacity	134/ Lit.	Charge capacity	m/
Stanok-kachalka	(Pumping) jack	135/	Pumping unit	
Spusko-pod"yemnyye raboty	Lowering and hoisting operations	Lit.	Running-in and pulling operations	
Spusk (obsadnykh trub)	Running-in (of) casing Lowering (of) casing	136/ Lit.	Running-in (of) casing	
Svetlyye (nefte-) produkty	Light oils Light (-colored) products	137/ Lit.	Light products or white products	n/
Temnyye (nefte-) produkty	Dark products	Lit.	Black products or dark products	o/
Temnyye masla	Black oils	138/	Black oils	

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Transliterated Russian Term	English Equivalent as Expressed by Dictionary Listing or Literal Translation		Preferred English Equivalent	
	Term	Source	Term	Comment
Trëkhsharoshechnoye doloto	Three cutting bit	Lit.	Three roller bit or tricone bit	
	(Three) roller bit	139/		
Truba, eksploatatsionnaya	Exploitation pipe Tubing	Lit. 140/	Tubing	
Ustanovka dlya vtorichnoy peregonki	Unit for the second distillation Rerun unit	Lit. 141/	Rerun unit	
Zakachka nefte produktov			Pumping of petroleum products	Deduced
Zakachka nefti			Pumping of crude oil or pumping of petroleum (depending upon context)	
Zamershchik debitov neftyanykh skvazhin			Oil well output gauger	Deduced

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Comment:

a. The term petroleum production is preferred unless the context specifically indicates crude oil production.

b. See the definitions of these terms in Section I.

c. The terms morskoy promysel and morskoy neftyanoy promysel have appeared frequently in Soviet petroleum literature in recent years in connection with the development of offshore petroleum deposits underlying the Caspian Sea (see neftyanoy promysel).

d. Usage suggests that this term applies to heavy diesel fuel (see this entry in Section I).

e. Usage indicates that this term denotes an input well or injection well used in secondary recovery operations, as distinct from a producing well.

f. The Russian noun neft' is translated in most Russian-English dictionaries as petroleum or oil, and translators use both terms without well-defined preference. Dictionary definitions alone will not show clearly what is meant by the Russian term neft' as used by the Soviet government in its statements on the production of petroleum. Actual usage appears to be the only criterion. Prewar usage is clearly defined. For example, in the official Third Five Year Plan (1938-42), 142/ the 1942 goal is clearly defined in one passage as "crude oil with gas (neft' syraya s gazom) -- 54 million tons," while a later passage states "Production of petroleum (neft') in 1942 must be 49.5 million tons without gas and 54 million tons with gas." Therefore, prewar Russian usage of neft' either means crude oil with natural gas -- that is, petroleum -- or means without natural gas -- that is, crude oil. The context may help to determine what is meant in each case.

Another prewar example of the Russian usage of neft' is in a political dictionary or lexicon published in 1940. 143/ It is apparently intended for use as a reference handbook for economists and political writers. In the article on the petroleum industry appear the following statements: "The production of petroleum (neft') increased from 9.2 million tons in 1913 to 32.2 million

tons in 1938, i.e., by 3.5 times ... . In the Third Five-Year Plan ending in 1942 the production of petroleum (neft') will increase to 54 million tons, . . . 177 percent in relation to the year 1937." According to official Soviet sources, the 1913 production cited above includes no gas 144/; the 1938 figure cited includes over 2 million tons of gas 145/; and the 1942 goal includes 4.5 million tons of gas. 146/

Postwar Russian usage of the term neft' in Soviet official production goals and claims does not clearly discriminate by context whether natural gas is included. Although separate goals and claims are given for neft' (petroleum) and for gaz (gas), separate goals and claims are also given for gasoline and other commodities derived from neft'. Consequently, unless the context specifically indicates that crude oil is meant by the term neft', it is recommended that it be translated as petroleum, the more generic English term.

In translating postwar Soviet petroleum literature, the context will often clearly indicate that crude oil is meant by the term neft'. This is the case in source 147/, a book affording basic data on classification and specifications of Soviet crude oils. When the context clearly indicates that crude oil is meant, this equivalent is recommended.

g. Although this translation is recommended, the term neftyanoy promysel does not appear to be synonymous with the US term oilfield in its broader sense but rather refers to a specific enterprise operating in a given oilfield. In postwar Soviet petroleum literature, the neftyanoy promysel is a basic subdivision of an oil production trust or association and hence denotes a form and level of business organization in the producing phase of the Soviet petroleum industry. Within the context of oilfield operations, the Russian term may be shortened to simply promysel.

h. The term pererabotka may be translated as refining only in the generic sense so as to include primary distillation, chemical and physical methods of treatment, rerunning, cracking, and blending. 148/ Refining in the strictest sense is covered by the term ochistka.

i. Distillation unit is the more general term. In context this term may apply specifically to a topping unit in an oil refinery.

j. Use of the term plastovaya neft' in Soviet sources such as source 149/ indicates that it is synonymous with the term reservoir oil as used in US texts such as source 150/. The water occurring below the oil layer in the reservoir is known in US terminology as formation water. In US practice the term reservoir fluids embraces reservoir oil, gas, and water.

k. Apparently applies to the US term additive in the broad sense so as to include dopes.

l. The term prokhodka refers to progress in drilling operations and is often expressed in terms of meterage drilled.

m. The root meaning of this expression plus the entry under the term capacity in source 151/ suggests that charge capacity rather than throughput is expressed by propusknaya sposobnost'.

n. This term designates the gravimetrically lighter and lighter colored fuels from gasoline down to but not including heavy diesel fuel (compare source 152/). Source 152/indicates that this term includes heavy diesel fuel, mazuts, gudrons, and bitumen. In US practice, dark lubricating oils may be included in this grouping. The Soviet practice, however, is to set up a third grouping of products for lubricating oils, distinct from both light products (svetlyye produkty) and dark products (temnyye produkty).

APPENDIX A

SELECTED BIBLIOGRAPHY

The following bibliography (UNCLASSIFIED) is selected from a rather large number of publications, most of which are specifically referred to as sources in Appendix D. They are grouped according to their principal significance to Sections I, II, and III.

Section I

Dictionaries and Glossaries Relating to Petroleum

These are specific sources for undocumented definitions, particularly in Group B and Group C.

American Petroleum Institute, Division of Refining. Glossary of Terms Used in Petroleum Refining, New York, 1953.

Porter, H.P. Petroleum Dictionary for Office, Field and Factory, 4th ed, Houston, Gulf Publishing Company, 1948.

Navy, Bureau of Naval Personnel. NAVPERS 10883, Fundamentals of Petroleum (Glossary and Bibliography), 1953.

Dunstan, A.E., et al., eds. The Science of Petroleum: A Comprehensive Treatise of the Principles and Practice of the Production, Refining, Transport and Distribution of Mineral Oil (Nomenclatures), 6 vols, New York, Oxford University Press, 1938.

Turner, F.M., ed. The Condensed Chemical Dictionary, 3d ed, New York, Reinhold Publishing Company, 1942.

Section II

Reference Publications for Conversion Factors Relating to the Petroleum Industry

Commerce, National Bureau of Standards. Miscellaneous Publication M121, Units of Weight and Measure, Washington, 1946.

Defense, Office of the Assistant Secretary of Defense, Supply and Logistics, Petroleum Office. Petroleum Conversion Factors and Capacity Tables for Logistics Planning, Washington, Nov 53.

Commerce, National Bureau of Standards. Circular C 410, National Standard Petroleum Tables, Washington, 1936.

Section III

Russian-English and English-Russian Dictionaries

Allied Control Commission for Germany, French Element, Oil Section. Glossary of Technical Terms of the Oil Industry, 2d ed, Berlin, 1946. (in French, English, Russian, and German)

Army, Army Map Service. Technical Manual no 12, Russian Glossary, 2d ed, Washington, 1951.

Callaham, Ludmilla I. Russian-English Technical and Chemical Dictionary, New York, John Wiley & Sons, Inc., 1947.

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APPENDIX B

METHODOLOGY

The methodology used in the preparation of this research aid is obvious in its presentation. Straightforward quotation and direct derivation from the sources cited have been used throughout. The nature of the material is such that no involved or obscure methodology is required.

In two cases which are cited in the text (natural gas liquids and natural gases, Section II, Group B, 2 and 3) and in a third case cited in Appendix D, source 65/, it was necessary to compute the conversion factors shown from a selected array of basic data from various sources as cited. Engineering judgment is necessary in the selection of the relevant basic data, which are voluminous and not given in detail. Aggregation of the basic data into the final specific gravity values used in the calculation of conversion factors was by weighted averages as indicated in the text. The details of computation and aggregation are considered to be too voluminous for inclusion in the methodology.

APPENDIX C

GAPS IN INTELLIGENCE

Available intelligence was adequate for the compilation of Sections I and II of this research aid. Definite gaps in intelligence were encountered in the preparation of Section III. As stated in the text, lack of a comprehensive and authoritative Russian-English petroleum dictionary is a severe handicap to analysts and translators working in this field. Continued study of the Russian language by petroleum technologists and increasing coordination with linguists will gradually reduce the seriousness of this problem.

APPENDIX D

SOURCE REFERENCES

Evaluations, following the classification entry and designated "Eval.," have the following significance:

Source of Information	Information
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

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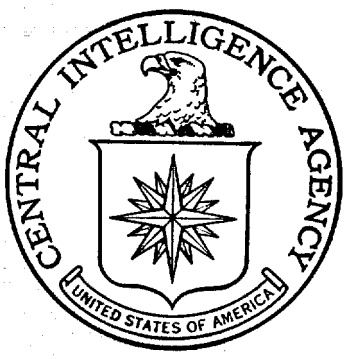

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